(19)日本国特許庁（ＪＰ）　(12)特　許　公　報（Ｂ２）　(11)特許番号

第2623762号

(45)発行日　平成９年(1997)６月25日　(24)登録日　平成９年(1997)４月11日

| (51)Int.Cl.[6] | 識別記号 | 庁内整理番号 | ＦＩ | | 技術表示箇所 |
|---|---|---|---|---|---|
| Ｈ０１Ｌ　21/60 | ３１１ | | Ｈ０１Ｌ　21/60 | ３１１Ｓ | |

請求項の数４(全　５　頁)

(21)出願番号　特願昭63－225725

(22)出願日　昭和63年(1988)９月９日

(65)公開番号　特開平2－34950

(43)公開日　平成２年(1990)２月５日

(31)優先権主張番号　特願昭63－106094

(32)優先日　昭63(1988)４月28日

(33)優先権主張国　日本（ＪＰ）

(73)特許権者　999999999
セイコーエプソン株式会社
東京都新宿区西新宿２丁目４番１号

(72)発明者　橋元　伸晃
長野県諏訪市大和３丁目３番５号　セイコーエプソン株式会社内

(74)代理人　弁理士　上柳　雅誉　(外１名)

審査官　金　公彦

(56)参考文献　特開　昭63－102329（ＪＰ，Ａ）
特開　昭51－22367（ＪＰ，Ａ）
特開　昭63－102110（ＪＰ，Ａ）
特開　平２－71536（ＪＰ，Ａ）
特開　昭52－48470（ＪＰ，Ａ）
特開　昭63－136639（ＪＰ，Ａ）

(54)【発明の名称】　半導体素子の実装構造

1

(57)【特許請求の範囲】

【請求項１】裏面に金属突起電極を有する半導体素子を配線基板上の所定の配線パターン上に実装する半導体装置の製造方法において、

前記配線基板上に接着剤の第１成分とマイクロカプセルに充填されている前記接着剤の第２成分とを含む樹脂を塗布する工程、前記配線パターンの所定の位置に、前記半導体素子の前記金属突起電極を圧着するとともに、前記マイクロカプセルを開裂し、前記第１成分と前記第２成分とを混合することにより、接着能を発現させる圧着工程を有することを特徴とする半導体装置の製造方法。

【請求項２】前記樹脂は導電粒子を含み、前記圧着工程は、前記所定の配線パターンと前記金属突起電極の間に前記導電粒子を介在させたことを特徴とする請求項１記載の半導体装置の製造方法。

2

【請求項３】裏面に金属突起電極を有する半導体素子を配線基板上の所定の配線パターン上に実装する半導体装置の製造方法において、

前記半導体素子の裏面上に接着剤の第１成分とマイクロカプセルに充填されている前記接着剤の第２成分とを含む樹脂を塗布する工程、前記配線パターンの所定の位置に、前記半導体素子の前記金属突起電極を圧着するとともに、前記マイクロカプセルを開裂し、前記第１成分と前記第２成分とを混合することにより、接着能を発現させる圧着工程を有することを特徴とする半導体装置の製造方法。

【請求項４】前記樹脂は導電粒子を含み、前記圧着工程は、前記所定の配線パターンと前記金属突起電極の間に前記導電粒子を介在させたことを特徴とする請求項３記載の半導体装置の製造方法。

【発明の詳細な説明】

［産業上の利用分野］

本発明は、半導体素子と配線基板との接続方法に関し、フェースダウン実装に関する半導体装置の製造方法に関するものである。

［従来の技術］

従来、フェースダウンによる半導体素子と基板との実装は、例えば、特開昭60－262430号公報に記載され、第２図に示すような構造が知られていた。第２図において、１は配線基板であり、この上に配線パターン２が形成されている。配線基板１は、ガラス、セラミクス、樹脂もしくは金属酸化物を表面に被覆した金属等の平面に、少くとも半導体素子６の金属突起４と対応した位置に配線パターン２が形成してある。配線パターンは金属であれば何でも良い。配線基板１上か、もしくは半導体素子６の能動面上に、光又は熱硬化性樹脂９を塗布、載置する。次に、半導体素子上の金属突起４と配線基板１上の配線パターン２とを位置合わせし、両者を圧接する。この圧接により光又は熱硬化性樹脂９は押し広げられ、金属突起４と配線パターン２とは電気的接続を得、結極半導体素子６上に形成された電極パッド５と配線パターン２との電気的接続が得られる。この状態で、光又は熱硬化性樹脂９に、光もしくは熱を加えればその樹脂は硬化するので、半導体素子６と配線基板１とは、上記電気的導通が保持されたまた固定される。

〔発明が解決しようとする課題〕

しかし、従来の半導体素子の実装構造では、半導体素子と配線基板との保持に光又は熱硬化性樹脂を用いるため、光又は熱硬化性樹脂を硬化させる際に光又は熱を加えなければならなかった。光又は熱を半導体素子に加えるために、専用の硬化装置が必要であり、その導入投資のために、製品自体のコストが高くなるという問題点を有していた。また、硬化装置は高精度の平坦度を保持しながら、光又は熱を加える必要が有り、実装時に熱で平坦度がずれるなど、その保守も煩雑であるという問題点を有していた。

このような問題点を解決するため、本発明では半導体素子と配線基板との保持に光又は熱硬化性樹脂を用いずに、高価な専用の実用装置も不要で、保守の簡便な装置で実装できる半導体素子の実装構造を提供することを目的としている。

〔課題を解決するための手段〕

上記問題点を解決するため、本発明は、裏面に金属突起電極を有する半導体素子を配線基板上の所定の配線パターン上に実装する半導体装置の製造方法において、前記配線基板上に接着剤の第１成分とマイクロカプセルに充填されている前記接着剤の第２成分とを含む樹脂を塗布する工程、前記配線パターンの所定の位置に、前記半導体素子の前記金属突起電極を圧着するとともに、前記マイクロカプセルを開裂し、前記第１成分と前記第２成分とを混合することにより、接着能を発現させる圧着工程を有することを特徴とする。



また裏面に金属突起電極を有する半導体素子を配線基板上の所定の配線パターン上に実装する半導体装置の製造方法において、前記半導体素子の裏面上に接着剤の第１成分とマイクロカプセルに充填されている前記接着剤の第２成分とを含む樹脂を塗布する工程、前記配線パターンの所定の位置に、前記半導体素子の前記金属突起電極を圧着するとともに、前記マイクロカプセルを開裂し、前記第１成分と前記第２成分とを混合することにより、接着能を発現させる圧着工程を有することを特徴とする。

更に前記樹脂は導電粒子を含み、前記圧着工程は、前記所定の配線パターンと前記金属突起電極の間に前記導電粒子を介在させたことを特徴とする。

〔作　用〕

本発明では、半導体素子と配線パターンを有する基板との間にマイクロカプセルを含有した樹脂を存在させたので、単に半導体素子と配線基板を位置合わせした後圧接するだけで、半導体素子と配線基板の接触部分に存在するマイクロカプセルが開裂し、樹脂の硬化に必要な硬化剤、溶剤あるいは樹脂そのものが放出され、半導体素子と配線基板の間に存在する樹脂の硬化が完結し、半導体素子と配線基板が電気的導通を保ったまま保持され続ける。

また本発明では、半導体素子と配線パターンを有する配線基板との間にマイクロカプセルと導電粒子を含有する樹脂を存在させたので、圧接時に、マイクロカプセルの開裂・樹脂の硬化の完結と同時に、半導体素子と配線基板の接触部分に存在する導電粒子がそのまま存在し続け、半導体素子と配線パターンとの間の上下方向の導通のみを保持し続ける。

〔実　施　例〕

以下に本発明の実施例を図面に基き、詳細に説明する。

第１図は、本発明の半導体素子の実装構造の断面図である。半導体素子６の電極パッド５に、例えばCr－Cu、Ti－Pd等の金属を被着した後、金属突起４を形成する。金属突起４はAu、Cu、ハンダ等の金属であり、電気メッキ、スパッタ、蒸着等で数μm～数10μmの厚さに形成されることが多い。配線基板１は、ガラス、セラミクス、樹脂等であり、少なくとも表面が絶縁されており、半導体素子６の金属突起４と対応した位置に配線パターン２が形成されている。配線パターンは、金属もしくは、複数の金属、金属酸化物等を用いるのが一般的であり、Ni、Cu、Au、Al又はITO等をメッキ、スパッタ、蒸着等の方法で形成すれば良い。配線基板１面上か、もしくは半導体素子６の金属突起４を形成した面上に樹脂３を塗布あるいは設置する。樹脂３は、液状もしくはシート状であって、樹脂３中にはマイクロカプセル７が分散

5

存在している。

次に、半導体素子６上の金属突起４と配線基板１上の配線パターン２とを位置合わせし、両者を圧接する。すると、主に直接接触する金属突起４と配線パターン２とにより押し広げられる樹脂３中に存在するマイクロカプセル７が開裂し、マイクロカプセル７中に含まれ、樹脂３が接着剤としての性能を示す硬化、粘着等の性状を発現するための、硬化剤、溶剤あるいは樹脂そのものが放出され、硬化もしくは接着、粘着が始まり、やがて完了する。この状態では、金属突起４と配線パターン２は電気的に接続が行なわれており、この接続は保持されたまま固定され続ける。樹脂３の周囲に、さらに耐湿性を向上させるために樹脂を塗布しても良い。

第３図は、本発明のその他の実施例を示している半導体素子の実装構造の断面図である。樹脂３中には、マイクロカプセル７の他、導電粒子８が存在している。導電粒子８は、Ni、Cr等の金属粉もしくはそのメッキ物、ハンダ粒子、ポリスチレン等のプラスチック上にNi、Au等のメッキを施してある粒子等であり、導電性を有する物であれば何でも良い。その他の実装構造、材料、方法等は、第１図の実施例において説明したのとまったく同一である。ただ、この実施例においては、金属突起４と配線パターン２との間に、導電粒子８が存在しており、このため、単なる接着剤による圧接に比べてより実装信頼性は向上する。当然、導電粒子８の混合濃度は隣接する金属突起４同志、あるいは配線パターン２同志が短絡しない程度におさえなければならない。

ここで、本発明の半導体素子の実装構造に用いられるマイクロカプセルについて述べる。マイクロカプセルを用いた接着の系については、大きく分けて次の４つの系が公知である。

１）感圧性カプセル接着剤：接着剤の全量をカプセル化している接着剤である。この場合は、樹脂３全量がマイクロカプセル７で構成されていることになる。

２）溶剤再活性型カプセル接着剤：接着剤組成中の溶剤成分だけをカプセル化する。この溶剤カプセルを接着剤溶媒中に分散させ、接着時には圧力を加えて溶剤を放出させ接着作用を与える。

３）熱再活性カプセル接着剤：溶剤再活性型と似ているが、カプセル壁材に熱溶融性のポリマーを用い；カプセルに封入される物質は溶剤の代わりに可塑剤を使用する。

４）反応型カプセル接着剤:2成分型接着剤の硬化剤成分をカプセル内に封入し、これを樹脂成分と混合して一成分とし、圧接時に反応成分を放出させて接着する。

実施例では、これらの系のうちいずれかのマイクロカプセルを使用する。

さて、実際のマイクロカプセルの製法について説明する。マイクロカプセル化は物質の微小粒子を薄い均一なポリマーの連続膜で再現的に被覆する方法で、この方法

6

で作られた数μmから数百μmの微小カプセルを“マイクロカプセル”と呼んでいる。従って、マイクロカプセルはいわば顕微鏡的な微小カプセルの包装容器ともいうべきものである。

カプセル内に封入される物質は、液体・溶液・固体のいずれでも良く、カプセル内に封入された物質は外界から隔離された状態で保存され、必要な時に適当な方法、例えば加圧によってカプセル内から放出される。

マイクロカプセルの工程は、第４図に示すような連続撹拌の下で行なわれる３つの手順から成る。第４図（ａ）は、液体分散媒12と核物質10（カプセル化される物質）と壁物質11（カプセル化する物質）の３相系の生成工程である。壁物質は多くの場合ポリマーの溶液である。この工程では分散媒12中に、核物質10を微粒子状に撹拌ロッド13を回転することにより分散させ、次にこの系に壁膜を形成する物質11を加えて３相系を生成させる。

第４図（ｂ）は、核物質粒子10の周囲に壁物質11のポリマーが集合沈積する段階である。壁ポリマーの集積は、核物質と液体分散媒の界面におけるポリマーの吸着に依存しているので、カプセル化を有効に行うためには、系の全界面自由エネルギーを減少させることが必要である。

第４図（ｃ）は、壁物質の表面に集積した液状壁ポリマーの固化段階である。第４図（ｂ）の段階で核物質の周囲に形成された壁ポリマーはまだ液状で不安定であるため、化学的あるいは物理的にこれを強化し、安定な膜にする必要がある。液膜の強化方法としては、冷却、架橋、硬化、脱溶媒和などの方法が用いられる。このようにして、安定なマイクロカプセルが形成され、これを目的樹脂中に混合すれば良い。もしくは、マイクロカプセル全量が樹脂そのものである場合も有る。また、この段階で導電粒子を混入すれば、樹脂中にマイクロカプセルと導電粒子が存在することになる。

さらに、具体的にマイクロカプセル含有の樹脂の製法について述べる。樹脂本体は、ネオプレンAD－20……300部、MgO……12部、ZnO……15部、NeOZOne“D”……45部、NeVilleR－14……900部、亜麻仁油……45部、トルエン……1917部から成っている。この上に、エチルセルロースを壁物質、四塩化炭素を核物質、液体分散媒として形成されたマイクロカプセルを塗布する。この状態の樹脂を第１図に示されるように半導体素子と配線基板にはさみ込み、位置合わせ後、加圧する。するとマイクロカプセル中に含まれた四塩化炭素が、開裂・放出され、それが樹脂を溜らし接着に至る。このまま、半導体素子と配線基板とが保持され続ける。

また、樹脂本体中に導電粒子としてNi粉末を混入しておくと、圧接時に、半導体素子の金属突起と配線パターンとの間にNi粉末が存在したまま、半導体素子と配線基板が保持され続ける。

7

〔発明の効果〕

以上、説明したように本発明による半導体素子の実装構造では、半導体素子と配線基板との間にマイクロカプセルを含有した樹脂を存在させ、それらを保持させる構造としたので以下の効果を持つ。

（1）圧接時に、従来の光又は熱を同時に加える装置が不要となったので、加圧機構のみの簡略化した装置で済み、装置コストが低減する。また、実装時には加圧のみのため、実装性も向上する。

（2）装置そのものも、加圧機構のみになるため、保守、調整等も大幅に簡略化される。

（3）硬化・接着等に必要な成分を樹脂から完全に分離してあるので、従来の光又は熱硬化性樹脂よりも、保存性が大幅に向上する。

（4）圧接時に半導体素子に加わるエネルギーは、微少なので、圧接時に半導体素子に与えるダメージが激減し、そのダメージによる半導体素子・配線基板の不良は発生しなくなる。

さらに、説明したように本発明による半導体素子の実装構造では、半導体素子と配線基板との間にマイクロカプセルと導電粒子を含有した樹脂を存在させ、それを保持させる構造としたので、前述の効果に加えさらに以下の効果を持つ。

（5）半導体素子の金属突起と配線パターンの間に導電粒子が存在するため、金属突起の高さのバラツキを導電粒子が吸収できるため、より高い信頼性の実装が可能になる。

（6）また、導電粒子がクッション材的な役割を行い、

8

圧着の圧力に対するマージンも広がるため、圧着装置の保守、例えば平坦度の調整等がよりシビアでなくなり、調整も簡略化できる。

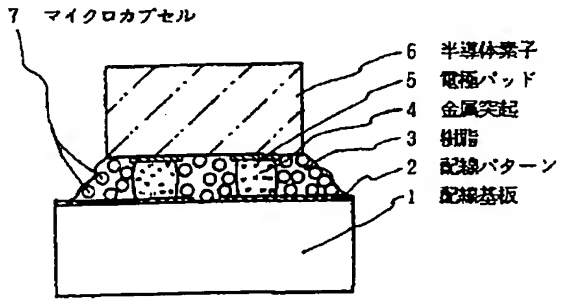
（7）混入する導電粒子の熱膨張係数を半導体素子、配線基板に近い物を導入すれば、樹脂の見かけの熱膨張係数は半導体素子、配線基板に近ずくため、熱ストレスによる半導体～素子配線基板間のオープンモード不良の発生をおさえることができる。

【図面の簡単な説明】

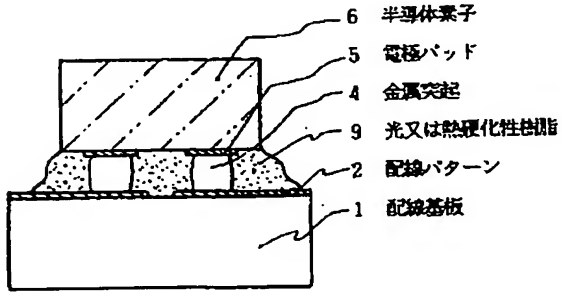
第１図は、本発明による半導体素子の実装構造を示す断面図であり、第２図は従来の半導体素子の実装構造を示す断面図である。第３図は、本発明による半導体素子の実装構造を示す断面図であり、第４図（ａ）～（ｃ）は、本発明による半導体素子の実装構造に用いられるマイクロカプセルの製造工程概略図である。

1……配線基板
2……配線パターン
3……樹脂
4……金属突起
5……電極パッド
6……半導体素子
7……マイクロカプセル
8……導電粒子
9……光又は熱硬化性樹脂
10……核物質
11……壁物質
12……液体分散媒
13……撹拌ロッド

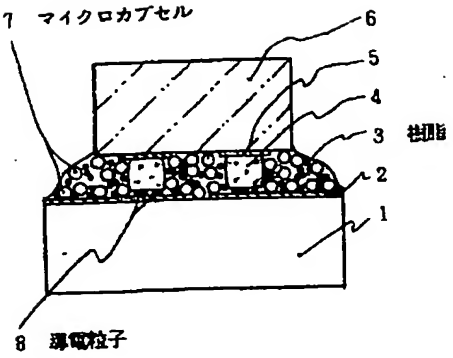
【第１図】



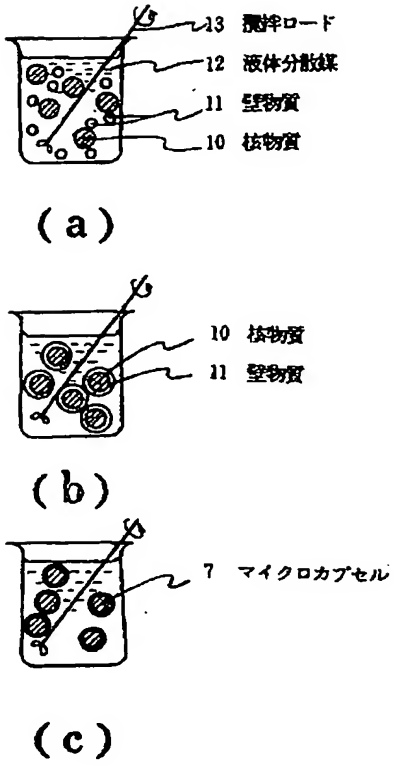

【第２図】



【第３図】


7 マイクロカプセル
6
5
4
3 樹脂
2
1
8 導電粒子

【第４図】


13 攪拌ロード
12 液体分散媒
11 壁物質
10 核物質
(a)
10 核物質
11 壁物質
(b)
7 マイクロカプセル
(c)

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 02-034950
(43)Date of publication of application : 05.02.1990

(51)Int.Cl. H01L 21/60

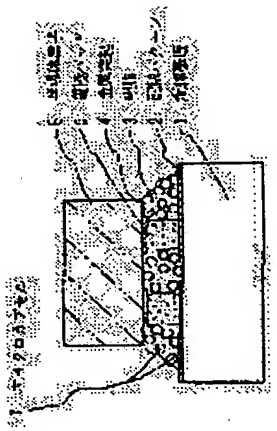
(21)Application number : 63-225725
(22)Date of filing : 09.09.1988

(71)Applicant : SEIKO EPSON CORP
(72)Inventor : HASHIMOTO NOBUAKI

(30)Priority
Priority number : 63106094 Priority date : 28.04.1988 Priority country : JP

## (54) MOUNTING STRUCTURE OF SEMICONDUCTOR ELEMENT

(57)Abstract:
PURPOSE: To merely pressurize at the time of mounting and to simplify maintenance, regulation, etc., by making resin containing a microcapsule exist between a semiconductor element and a wiring board.
CONSTITUTION: After the electrode pad 5 of a semiconductor element 6 is covered with metal, a metallic bump 4 is formed, and a wiring board 1 is formed with a wiring pattern 2 corresponding to the bump 4 of the element 6. The board 1 or the face formed with the bump 4 is coated with or mounted with resin 3. The resin 3 is liquid or sheetlike state, and microcapsules 7 containing curing agent is dispersed in the resin 3. Then, the bump 4 on the element 6 is aligned with the pattern 2 on the board 1, and both are pressurized in contact with one another. Thus, the bump 4 is electrically connected to the pattern 2, and they are continuously secured while the connection remains.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

1. JP,2623762,B

* NOTICES *



---

CLAIMS

---

(57) [Claim(s)]
[Claim 1] In the manufacture approach of a semiconductor device of mounting the semiconductor device which has a metal projection electrode at the rear face on a circuit pattern predetermined [ on a wiring substrate ] While sticking said metal projection electrode of said semiconductor device to the position of the process which applies the resin containing the 1st component of adhesives, and the 2nd component of said adhesives with which the microcapsule is filled up on said wiring substrate, and said circuit pattern by pressure The manufacture approach of the semiconductor device characterized by having the sticking-by-pressure process which makes adhesion ability discover by cleaving said microcapsule and mixing said 1st component and said 2nd component.
[Claim 2] For said sticking-by-pressure process, said resin is the manufacture approach of the semiconductor device according to claim 1 characterized by making said electric conduction particle intervene between said predetermined circuit pattern and said metal projection electrode including an electric conduction particle.
[Claim 3] In the manufacture approach of a semiconductor device of mounting the semiconductor device which has a metal projection electrode at the rear face on a circuit pattern predetermined [ on a wiring substrate ] The process which applies the resin containing the 1st component of adhesives, and the 2nd component of said adhesives with which the microcapsule is filled up on the rear face of said semiconductor device, The manufacture approach of the semiconductor device characterized by having the sticking-by-pressure process which makes adhesion ability discover by cleaving said microcapsule and mixing said 1st component and said 2nd component while sticking said metal projection electrode of said semiconductor device to the position of said circuit pattern by pressure.
[Claim 4] For said sticking-by-pressure process, said resin is the manufacture approach of the semiconductor device according to claim 3 characterized by making said electric conduction particle intervene between said predetermined circuit pattern and said metal projection electrode including an electric conduction particle.

---

[Translation done.]

* NOTICES *



## DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Industrial Application]
This invention relates to the manufacture approach of the semiconductor device about face down mounting about the connection method of a semiconductor device and a wiring substrate.
[Description of the Prior Art]
Conventionally, mounting with the semiconductor device and substrate by face down was indicated by JP,60-262430,A, and structure as shown in drawing 2 was known. In drawing 2 , 1 is a wiring substrate and the circuit pattern 2 is formed on this. The circuit pattern 2 is formed in the location corresponding to the flat surface of the metal with which the wiring substrate 1 covered glass, ceramics, resin, or a metallic oxide on the front face with the metal projection 4 of a semiconductor device 6 at least. If a circuit pattern is a metal, it is good anything. the wiring substrate 1 top -- or light or thermosetting resin 9 is applied and laid on the active side of a semiconductor device 6. Next, alignment of the metal projection 4 on a semiconductor device and the circuit pattern 2 on the wiring substrate 1 is carried out, and the pressure welding of both is carried out. Light or thermosetting resin 9 is extensible with this pressure welding, the metal projection 4 and a circuit pattern 2 obtain electrical installation, and the electrical installation of the electrode pad 5 and circuit pattern 2 which were formed on the **** semiconductor device 6 is obtained. In this condition, since that resin will be hardened if light or heat is applied, the above-mentioned electric flow was held and a semiconductor device 6 and the wiring substrate 1 are fixed to light or thermosetting resin 9.
The technical problem which [invention tends to solve
However, with the mounting structure of the conventional semiconductor device, in order to use light or thermosetting resin for maintenance with a semiconductor device and a wiring substrate, when stiffening light or thermosetting resin, light or heat had to be applied. In order to apply light or heat to a semiconductor device, it had the trouble that the hardening equipment of dedication was required and the cost of the product itself became high for the introductory capitalization. Moreover, holding the display flatness of high degree of accuracy, hardening equipment had the need of applying light or heat, and had the trouble that it was complicated that display flatness shifts with heat at the time of mounting etc. also as for the maintenance.
In order to solve such a trouble, in this invention, without using light or thermosetting resin for maintenance with a semiconductor device and a wiring substrate, the practical use equipment of expensive dedication is also unnecessary, and it aims at offering the mounting structure of the semiconductor device which can be mounted with the simple equipment of maintenance.
[The means for solving a technical problem]
In the manufacture approach of a semiconductor device of mounting the semiconductor device to which this invention has a metal projection electrode at the rear face on a circuit pattern predetermined [ on a wiring substrate ] in order to solve the above-mentioned trouble While sticking said metal projection electrode of said semiconductor device to the position of the process which applies the resin containing the 1st component of adhesives, and the 2nd component of said adhesives with which the microcapsule is filled up on said wiring substrate, and said circuit pattern by pressure It is characterized by having the sticking-by-pressure process which makes adhesion ability discover by cleaving said microcapsule and mixing said 1st component and said 2nd component.
Moreover, the semiconductor device which has a metal projection electrode at the rear face is set to the manufacture approach of the semiconductor device mounted on a circuit pattern predetermined [ on a wiring substrate ]. The process which applies the resin containing the 1st component of adhesives, and the 2nd component of said adhesives with which the microcapsule is filled up on the rear face of said semiconductor device, While sticking said metal projection electrode of said semiconductor device to the position of said circuit pattern by pressure, it is characterized by having

the sticking-by-pressure process which makes adhesion ability discover by cleaving said microcapsule and mixing said 1st component and said 2nd component.
Furthermore, as for said resin, said sticking-by-pressure process is characterized by making said electric conduction particle intervene between said predetermined circuit pattern and said metal projection electrode including an electric conduction particle.
[For ** ]
Since the resin containing a microcapsule was made to exist in this invention between a semiconductor device and the substrate which has a circuit pattern Only by carrying out a pressure welding, after only carrying out alignment of a semiconductor device and the wiring substrate, the microcapsule which exists in the contact parts of a semiconductor device and a wiring substrate cleaves. The curing agent required for hardening, the solvent, or the resin itself of resin is emitted, and hardening of the resin which exists between a semiconductor device and a wiring substrate is completed, and it continues being held while the semiconductor device and the wiring substrate had maintained the electric flow. Moreover, a semiconductor device and the electric conduction particle which exists in the contact part of a wiring substrate continue existing in a conclusion and coincidence of hardening of the cleavage and resin of a microcapsule as it is, and holding only a flow of the vertical direction between a semiconductor device and a circuit pattern in this invention, at the time of a pressure welding, since a microcapsule and the resin containing an electric conduction particle were made to exist between a semiconductor device and the wiring substrate which has a circuit pattern is continued.
[The example of fruit ** ]
The example of this invention is explained at a detail based on a drawing below.
Drawing 1 is a sectional view of the mounting structure of the semiconductor device of this invention. After putting metals, such as Cr-Cu and Ti-Pd, the metal projection 4 is formed in the electrode pad 5 of a semiconductor device 6. The metal projections 4 are metals, such as Au, Cu, and a pewter, and are formed in the thickness of several micrometers - 10 micrometers of numbers by electroplating, the spatter, vacuum evaporationo, etc. in many cases. The wiring substrates 1 are glass, ceramics, resin, etc., the front face is insulated at least and the circuit pattern 2 is formed in the metal projection 4 of a semiconductor device 6, and the corresponding location. As for the circuit pattern, it is common to use a metal or two or more metals, a metallic oxide, etc., and it should just form nickel, Cu, Au, aluminum, or ITO by approaches, such as plating, a spatter, and vacuum evaporationo. the 1st page top of a wiring substrate -- or resin 3 is applied or installed on the field in which the metal projection 4 of a semiconductor device 6 was formed. Resin 3 has the shape of liquefied or a sheet, and the microcapsule 7 is recognizing [ resin ] distributed existence into resin 3. Next, alignment of the metal projection 4 on a semiconductor device 6 and the circuit pattern 2 on the wiring substrate 1 is carried out, and the pressure welding of both is carried out. Then, the microcapsule 7 which exists in resin 3 extensible [ with the metal projection 4 which mainly contacts directly, and a circuit pattern 2 ] cleaves, it is contained in a microcapsule 7, a curing agent, a solvent, or resin itself for resin 3 to discover descriptions which show the engine performance as adhesives, such as hardening and adhesion, is emitted, hardening or adhesion, and adhesion start, and it completes soon. In this condition, connection is made electrically, and the metal projection 4 and a circuit pattern 2 continue being fixed, while this connection had been held. Resin may be applied to it in order to raise moisture resistance to the perimeter of resin 3 further.
Drawing 3 is a sectional view of the mounting structure of a semiconductor device which shows the example of others of this invention. In resin 3, the electric conduction particle 8 besides a microcapsule 7 exists. If the electric conduction particle 8 is a particle which has plated nickel, Au, etc. on plastics, such as metal powders, such as nickel and Cr, or a plating object of those, a pewter particle, and polystyrene, and is an object which has conductivity, it is good anything. Other mounting structures, the ingredient, the approach, etc. are completely the same as that of having explained in the example of drawing 1 . However, in this example, the electric conduction particle 8 exists between the metal projection 4 and a circuit pattern 2, and, for this reason, mounting dependability improves more compared with the pressure welding by mere adhesives. Naturally, the mixed concentration of the electric conduction particle 8 must be pressed down to extent which metal projection 4 adjoining comrade or circuit pattern 2 comrade does not short-circuit.
Here, the microcapsule used for the mounting structure of the semiconductor device of this invention is described. About the system of adhesion using a microcapsule, it roughly divides and the following four systems are well-known.
1) Pressure-sensitive capsule adhesives : they are the adhesives which are encapsulating the whole quantity of adhesives. In this case, the resin 3 whole quantity will consist of microcapsules 7.
2) Solvent re-active type capsule adhesives : encapsulate only the solvent component under adhesives presentation. Distribute this solvent capsule in an adhesives solvent, apply a pressure at the time of adhesion, a solvent is made to emit, and an adhesion operation is given.

3) **** activity capsule adhesives : although the solvent re-active type is resembled, the matter which uses the polymer of thermofusion nature for a capsule wallplate, and is enclosed with; capsule uses a plasticizer instead of a solvent.
4) Reaction type capsule adhesives : enclose the curing agent component of 2 component-type adhesives in a capsule, mix this with a resinous principle, consider as one component, make a reaction component emit at the time of a pressure welding, and paste up at it.
In the example, one of microcapsules is used among these systems.
Now, the process of a actual microcapsule is explained. Microencapsulation is the approach of covering the minute particle of the matter with the continuation film of a thin uniform polymer in rendering, and is calling the "microcapsule" the several micrometers to hundreds of micrometers minute capsule made by this approach. Therefore, so to speak, a microcapsule should also be called container of a microscopic minute capsule.
Any of a liquid, a solution, and a solid-state are sufficient as the matter enclosed in a capsule, and the matter enclosed in the capsule is saved in the condition of having been isolated from the external world, and is emitted by the approach suitable by the way of being the need, for example, application of pressure, out of a capsule.
The process of a microcapsule consists of three procedures performed under continuation stirring as shown in drawing 4 . Drawing 4 (a) is the generation process of the three-phase-circuit system of the liquid dispersion medium 12, a nuclear material 10 (matter encapsulated), and the wall matter 11 (matter to encapsulate). In many cases, the wall matter is the solution of a polymer. The matter 11 which is made to distribute a nuclear material 10 by rotating the stirring rod 13 in the shape of a particle, and then forms wall membrane into a dispersion medium 12 at this system is added, and a three-phase-circuit system is made to generate at this process.
Drawing 4 (b) is a phase as for which the polymer of the wall matter 11 carries out a set deposit around the nuclear material particle 10. Accumulation of a wall polymer needs to decrease all the surface free energies of a system, in order to encapsulate effectively, since it is dependent on adsorption of the polymer in the interface of a nuclear material and a liquid dispersion medium.
Drawing 4 (c) is the solidification phase of the liquefied wall polymer accumulated on the front face of the wall matter. Since the wall polymer formed in the perimeter of a nuclear material in the phase of drawing 4 (b) is still liquefied and unstable, it needs to strengthen this chemically or physically and needs to make it the stable film. As the consolidation approach of liquid membrane, approaches, such as cooling, bridge formation, hardening, and desolvation, are used.
Thus, what is necessary is to form a stable microcapsule and just to mix this in objective-tree fat. Or the microcapsule whole quantity may be resin itself. Moreover, if an electric conduction particle is mixed in this phase, a microcapsule and an electric conduction particle will exist in resin.
Furthermore, the process of the resin of microcapsule content is described concretely. A resin body is [ .. 900 They are the section and linseed oil. / .. 45 They are the section and toluene. / .. 1917 Consist of the section ] the 20....neoprene AD-300 section and MgO.. They are the 12 sections and ZnO.. They are the 15 sections and NeOZOne"D".. 45 It is the section and NeVilleR-14. Besides, the microcapsule formed in ethyl cellulose considering the wall matter and a carbon tetrachloride as a nuclear material and a liquid dispersion medium is applied. The resin of this condition is inserted in a semiconductor device and a wiring substrate, as shown in drawing 1 , and it is pressurized after alignment. Then, cleavage and bleedoff of the carbon tetrachloride contained in the microcapsule are done, and it wets resin and results in adhesion. As it is, a semiconductor device and a wiring substrate continue being held.
Moreover, if nickel powder is mixed as an electric conduction particle into the resin body, while nickel powder had existed between metal projections and circuit patterns of a semiconductor device at the time of a pressure welding, a semiconductor device and a wiring substrate will continue being held.
[Effect of the Invention]
As mentioned above, the resin containing a microcapsule is made to exist between a semiconductor device and a wiring substrate with the mounting structure of the semiconductor device by this invention, as explained, and since it considered as the structure of making them holding, it has the following effectiveness.
(1) At the time of a pressure welding, since the equipment which applies a conventional light or conventional heat simultaneously became unnecessary, end with the equipment which only the application-of-pressure device simplified, and equipment cost decreases. Moreover, at the time of mounting, mounting nature also improves only for application of pressure.
(2) Since equipment itself becomes only an application-of-pressure device, maintenance, adjustment, etc. are simplified substantially.
(3) Since the component required for hardening, adhesion, etc. is thoroughly separated from resin, shelf life improves substantially rather than a conventional light or thermosetting resin.
(4) Since the energy which joins a semiconductor device at the time of a pressure welding is very small, the damage

given to a semiconductor device at the time of a pressure welding decreases sharply, and stop generating the defect of the semiconductor device and wiring substrate by the damage.
Furthermore, a microcapsule and the resin containing an electric conduction particle are made to exist between a semiconductor device and a wiring substrate with the mounting structure of the semiconductor device by this invention, as explained, and since it considered as the structure of making it holding, in addition to the above-mentioned effectiveness, it has the following effectiveness further.
(5) Since an electric conduction particle exists between the metal projection of a semiconductor device, and a circuit pattern and an electric conduction particle can absorb the variation in the height of a metal projection, mounting of higher dependability is attained.
(6) Moreover, since a cushioning material-[ an electric conduction particle ] role is performed and the margin to the pressure of sticking by pressure also spreads, maintenance of an application device, for example, adjustment of display flatness etc., becomes more severe less, and it can also simplify adjustment.
(7) If the object near a semiconductor device and a wiring substrate is introduced for the coefficient of thermal expansion of the electric conduction particle to mix, for a ****** reason, the coefficient of thermal expansion of the appearance of resin can press down generating of the poor open mode between the semi-conductor by heat stress - a component wiring substrate to a semiconductor device and a wiring substrate.

---

[Translation done.]

* NOTICES *



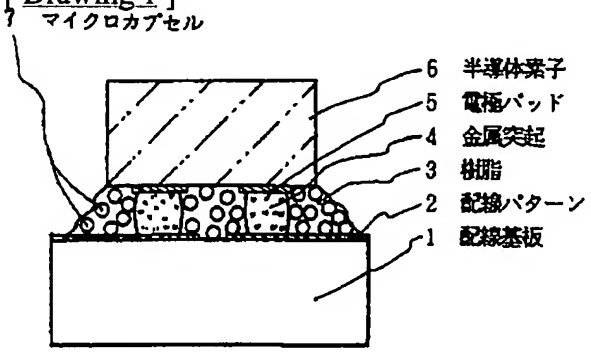
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

---

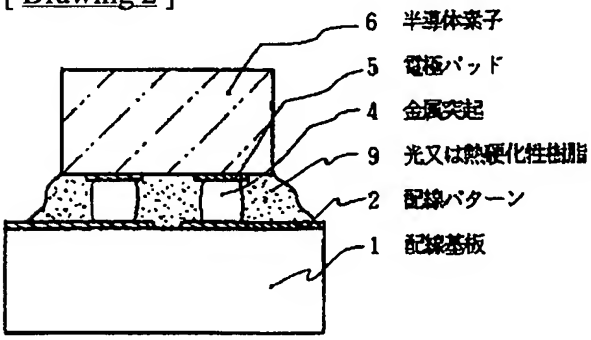
DRAWINGS

---

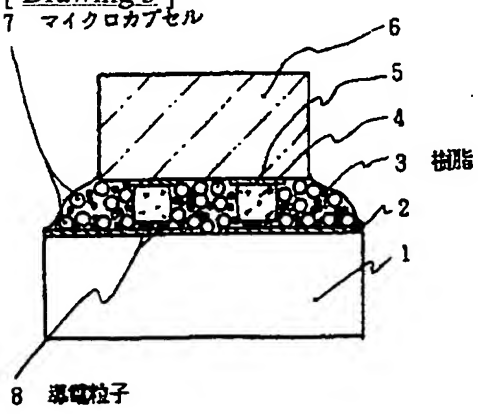
[ Drawing 1 ]



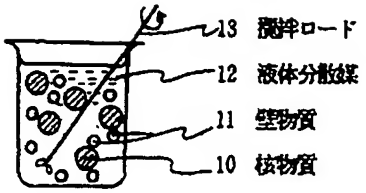

[ Drawing 2 ]



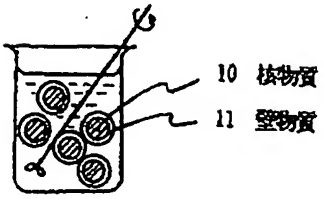

[ Drawing 3 ]



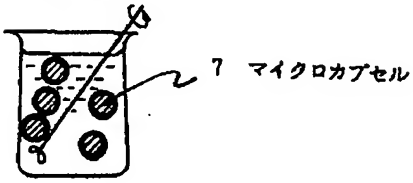

[ Drawing 4 ]




(a)




(b)




(c)

---

[Translation done.]